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Hon. Bette Stephenson, M.D., Minister
Harry K. Fisher, Deputy Minister

Curriculum Ideas for Teachers 1981

This support document to *The Formative Years*, one of a series dealing with the conservation of energy, provides information, student material, and suggestions to teachers for presenting this topic in the Primary Division.

Clothing and Shelter

Energy
P3

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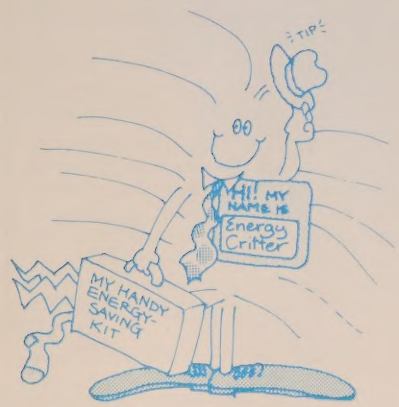
Introduction

After food, the most basic need of all animals is protection from the weather. Children will be able to identify readily with this concept, since they spend most of their time inside buildings, especially in the winter. However, since Canadian students are not usually responsible for paying heating bills, it might be difficult for them to understand the recent concern with "saving energy", "insulation", and other energy-related ideas.

The students who participate in the following activities should come to understand that shelter and clothing are obvious means of keeping warm or cool, and that both require the consumption or conversion of a great amount of energy. It is hoped that these activities will help students develop a sense of responsibility towards energy and the conservation of it by the society in which they live.



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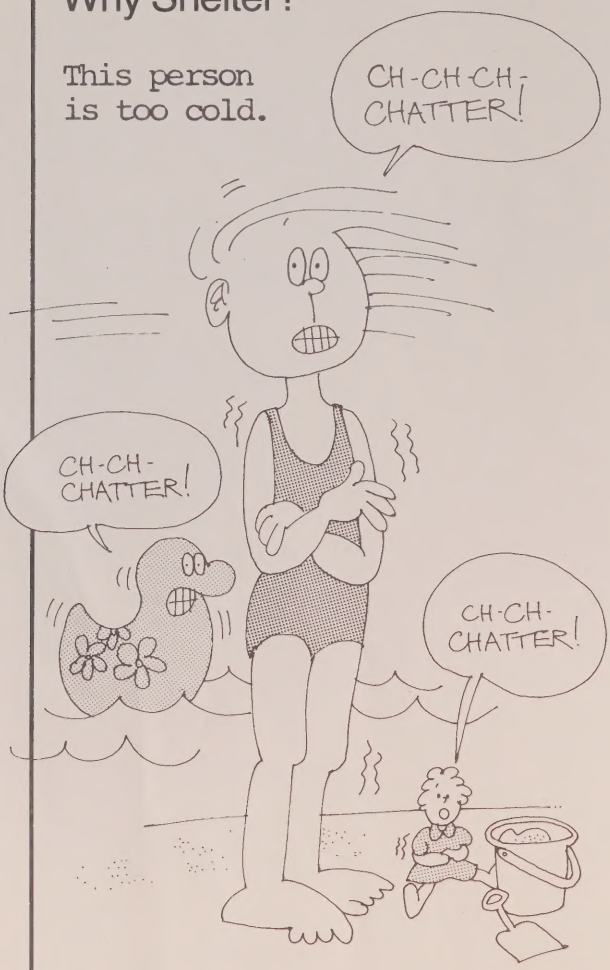
Why Shelter?

This person is too cold.



This person is too hot.

Cut out and paste (or draw) pictures on one side of a sheet of paper to show different ways that the cold person can get warm.

Now turn the paper over and show different ways that the warm person can get cool.

How many of these things are done inside?_____

How many of these things are done outside?_____

1. Draw a circle around the ways you can do all by yourself. How many are there? ☐
2. Draw a line under the ways in which a machine helped. How many are there? ☐
3. Put an "x" on your favourite way to keep warm.
4. Put a ☺ on your favourite way to keep cool.

Notes

Most Canadians work, play, or sleep inside buildings. Although we use other means of protection against cold and heat (e.g., a parka in winter or a swimming pool in summer), shelters demand a great amount of energy input. Energy is required to construct buildings, to heat or cool them, and to fuel the many conveniences that are found in them. Thus, businesses, shopping malls, industries, homes, and arenas require a large proportion of the available energy to provide and maintain our living quarters, recreation facilities, and working habitats.

Once your students have discussed different ways of keeping warm or cool and have assembled the pictures suggested on the activity sheet, you can introduce the idea that it takes *energy* to keep warm or cool — it takes *human energy* to rub your hands together when they are cold; it takes *wood energy* to fuel a campfire; and it takes *electrical energy* to run a fan.

After your students have discussed their favourite ways of keeping warm or cool, you can point out specific examples related to buildings. You should decide which energy concepts to develop further with your class. The following questions can be used to stimulate an introductory class discussion on this theme:

- Why do we live in houses?
- When do we stay inside a building the most? Why?
- What are all the things we do inside our house to keep warm? Cool? Which do you think is most important?
- Have you ever heard your parents complain about paying the heating bills? About buying clothes?
- Do TV shows ever talk about turning down the heat in buildings? Does the newspaper? Check and bring in examples.
- What does "energy" mean to you?

Follow-up Activities

1. Students' concepts of keeping warm and cool should revolve around the idea that we need to maintain a constant body temperature of 37°C. You can have them fill in their own charts like the following example, using clinical thermometers. Make sure that the thermometers are used in a safe and sanitary way.

Record your body temperature:	
in a cold room	_____
in a warm room	_____
outside	_____
in a car	_____
after running	_____
after sitting still	_____
after eating	_____

Follow-up:
What is a dog's normal body temperature? Ask a veterinarian. What is a groundhog's body temperature in February? Look in a library book, or check with a small animals expert.

2. Develop the concept of how various living things keep themselves warm or cool. Your students can make booklets on this topic by stapling together six sheets of newsprint and a cover made from construction paper. They can then either print their own sentences or paste in stencilled sentences. The following are some suggested sentences for this purpose:

- Birds have feathers.
- Snakes go underground.
- Trees have bark.
- Whales have blubber.
- Fish change their body temperature.
- Turtles carry their houses.

3. Students should be aware of keeping cool as well as keeping warm. They can make things that will keep them cool, such as (a) fans from various materials, and (b) lemonade.

Related Ideas

1. This game is called "What's the Weather Like?". To play it, you will have to make twelve cardboard thermometers showing approximate local temperatures for each month. Your students can then try to match each thermometer to the proper month. Check with the local weather bureau for correct readings for your region.

2. You can read selected poems to your students to create warm or cool moods. Your students can physically participate by shivering when a cold atmosphere is suggested by a poem or by wiping their brows when a warm atmosphere is suggested.

3. Play recordings of different selected pieces of music. Your students can discuss whether each piece suggests warmth or coolness. Have them move about, to interpret the various pieces of music in terms of keeping warm or keeping cool. For example, they can keep warm by running, hopping, or jumping rhythmically on the spot to fast music.

4. Have your students discuss warm and cool colours, and how using them in paintings creates the feeling of warmth or coolness. They can then paint pictures with these concepts of colour in mind.

5. Have your students put a blob of paint in the centre of a piece of art paper. By using a stiff piece of cardboard they can "fan out" the blob to create an abstract design, which is "a real *cool* picture".

6. Have your students fold a piece of newsprint in half and put the word "warm" on one half and the word "cold" on the other. Give them five to ten minutes to draw or print all the things that each word makes them think of.

Name:

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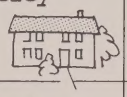
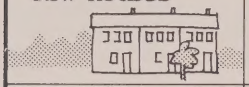
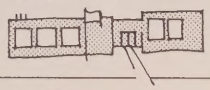
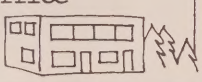
Types of Shelters

Make a graph of the different kinds of shelters near your school.

One-storey																				
Two-storey 																				
Apartment																				
Row houses 																				
Church																				
School 																				
Office 																				
Restaurant																				
Others																				
Totals	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

Put a blue circle around the kind of shelter you think would be the hardest to keep warm. Why will it be the hardest to keep warm? Put a red circle around the kind of shelter you think would be the easiest to keep warm. Why will it be the easiest to keep warm?

Notes

Once students have thought of ways of keeping warm or cool, they should be able to focus on the concept of keeping warm or cool in a contained space such as a home, school, or apartment. Several possible terms for shelter should also be developed (e.g., "building", "container", "protection", "interior" and "exterior", "materials", "residence", "dwelling").

There is a great deal of information available on saving energy. The conservation branch of Energy, Mines and Resources Canada has published a free booklet questionnaire called *Ener$ave for Home Insulation*. A toll-free hotline has also been instituted by which Canadian homeowners can call to ask for assistance on improving the heating efficiency of their homes or businesses. Several other publications, such as *The Home Energy Guide* and *100 Ways to Save Energy and Money in the Home*, are also available (see the bibliography). As well, energy consulting firms, which did not exist ten to fifteen years ago, are today advertising their services in some telephone directories. Even computers are being utilized to analyse characteristics of shelters so that recommendations can be suggested for energy savings.

One of the starting points for finding energy-saving improvements for a shelter is a consideration of the type, size, and shape of the building, and the kinds of materials used in its construction. An awareness of these structural features will promote thinking about the heating and cooling of large or small spaces. Such features as attics and basements in some buildings may offer more protection against the weather than do similar features in other types of buildings.

When beginning the research required to complete the activity sheet, limit the first day's activity to a walk around a predetermined number of blocks. Depending on the school's location, this will tend to limit the type of shelter to residential shelters ranging from one-storey houses to row houses. Once students are familiar with local homes, you will want to expand the number and variety of the buildings they survey in the local area.

The following questions can be used to stimulate and measure the students' knowledge of buildings:

- What kind is the tallest?
- What kind is the longest?
- Which has the most rooms?
- Which has the most space to live in?
- Which do people stay in the longest?
- Which ones do you like to stay in? Why?
- If you had a lot of money, which would you buy?
- If you had to pay the money to heat the building, which would you buy?

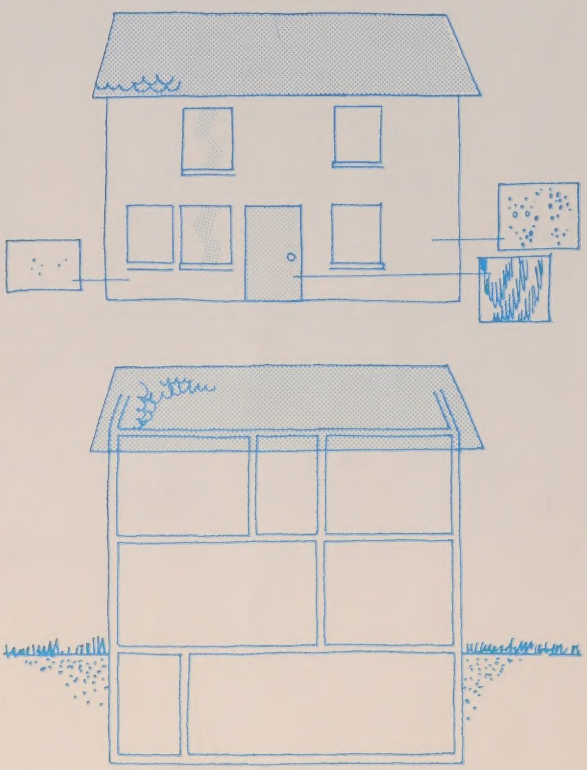
After the totals of each type of building have been calculated, the children can consider the following questions:

- Which is the most common kind of shelter?
- Which is the least common kind of shelter?
- Are there more big kinds or small kinds of shelters?
- Which type of building occupies the most space?

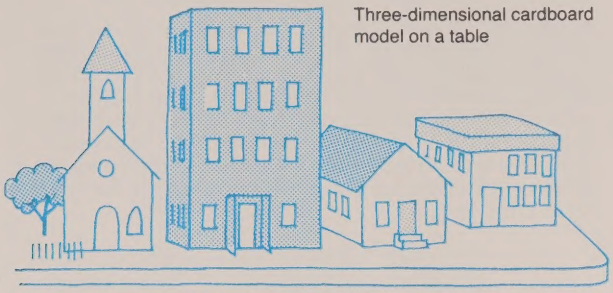
Follow-up Activities

1. Give your students square pieces of paper and have them make chalk or crayon rubbings of the materials used in the construction of the inside and outside of a building. The materials can include bricks, stones, drywall, concrete, and wood.

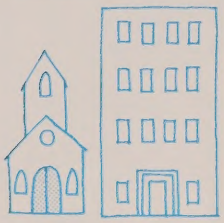
2. Have each child draw an inside and outside view of a large house (see the accompanying illustration) on a piece of paper and then paste the rubbings made in activity 1 around it. Each rubbing should then be connected by an arrow to the place where it would be located in or on the building. Have your students circle those materials that they think help keep us warm and those that help keep us cool. Ask them whether there are different materials in the places they can't see (e.g., inside the walls, in the attic).



3. Have your students make three-dimensional models using paper boxes of each of the different kinds of shelters that they saw. These can then be combined to make a street scene, as in the accompanying illustration.



Three-dimensional cardboard model on a table



Two-dimensional mural. Each child pastes his/her model on the mural.

4. In the late spring, students can build a lean-to shelter outdoors. They can use a camping book to find out how a reflector fire can keep the shelter warm. *Note*: If the lean-to is too big, it will never get warm inside.

Related Ideas

1. A visitor (such as an architect, carpenter, roofer, mason, or bricklayer) can be invited to the school to present a talk or demonstration to the children about the work he/she does (e.g., how to design an energy-saving house). The students can have questions prepared beforehand. After the visitor has left, the students can make oral presentations or you can make chart stories to summarize what has been learned.

2. The children can create construction poems like the following:

This is the house
that Jack built.
These are the bricks
that covered the house that Jack built.
These are the shingles
on top of the house that Jack built.
This is the wood
on the floor of the house that Jack built.
This is the plaster
on the walls of the house that Jack built.

3. Allow the children to take camera shots of all the different types of homes around the school. These can then be grouped or classified according to shape, size, or structural features.

4. The children can play-act:
a) the building of a one-storey house;
b) the building of an apartment;
c) building the CN Tower.
Ask them which took the most energy to do.

5. Provide coloured paper of different sizes and shapes and have the students make different kinds of buildings using only these shapes.

Name:

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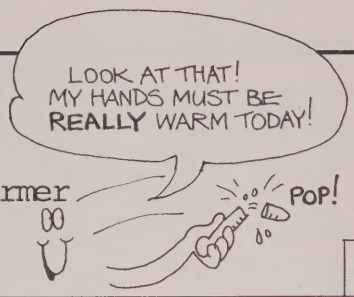
Heating Space



Thermometer readings go up when the air around the thermometers gets warmer

The air gets warm:	Check one. Yes	No
1. near an oven that is turned on		
2. under my arm		
3. near a shady window		
4. near my desk		
5. near the back of a fridge		
6. in a wastebasket		
7. near a light bulb		
8. near the chalk		
9. in a reading corner		
10. inside a fridge		
11. near a hot-air register		
12. near a chair		
13. near a sunny window		
14. under a coat		
15. near a toilet tank		
List others that you can find by yourself.		
16.		
17.		
18.		
19.		
20.		

Which was the warmest spot? _____

Why? _____

Notes

The purpose of this activity set is to develop the concept of the transfer of heat energy from one place to another. Students will already have learned why we need to heat air from the previous activities. Since space heating in residential, commercial, and industrial buildings is the second largest single consumer of energy after transportation, it is important that students realize that air is heated by some form of energy. Some discussion and knowledge of the two forms of energy — potential and kinetic — are also important to an understanding of heat energy.

Students should already have learned that air is the odourless, colourless, tasteless material that surrounds them. You should discuss and measure their knowledge of this and of the workings of the thermometer before they work through this activity sheet. They should then be given a mounted (safe) thermometer to take readings and record a "yes" or "no" answer for each location given in the activity. Students should be reminded to wait between readings to let the thermometer return to room temperature each time. They may work singly or in pairs. When this activity is completed, you can tally the students' results on a large class chart.

The following questions will help students understand what happened and why:

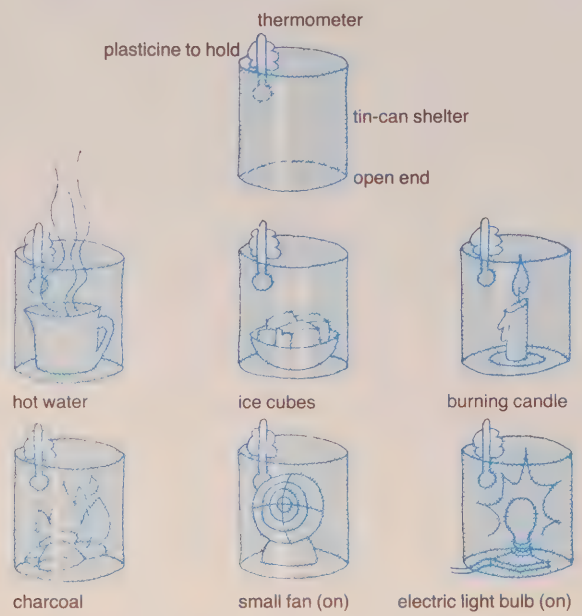
- Why did the thermometer readings go up? (extra heat)
- Did any thermometer stay the same? Why? (no extra heat)
- What heated the air?
- Why was the back of the refrigerator warm? (Work is done to make the inside of the refrigerator cool and heat is given off. Ammonia is the substance that is cooled. Students in Grade 3 could have explained to them how a refrigerator works.)

Follow-up Activities

1. Students can find different things that make the air cool. They can summarize their findings in a chart similar to the one on the activity sheet.

2. To illustrate the concept of heating or cooling space in an enclosed area (as in a building or a room), have the students make tin-can shelters. To do this, they should totally remove one end of a juice can and punch one small hole in the other end of the can. They should then place a thermometer in the small hole and attach it to the can with a piece of plasticine. The open end is then placed over different materials such as hot water, ice cubes, and so on (see the accompanying illustration). Discuss with your students which type of energy was used to heat or cool the shelter. The students can also find other ways to heat their tin-can homes (e.g., heating pads, light bulbs).

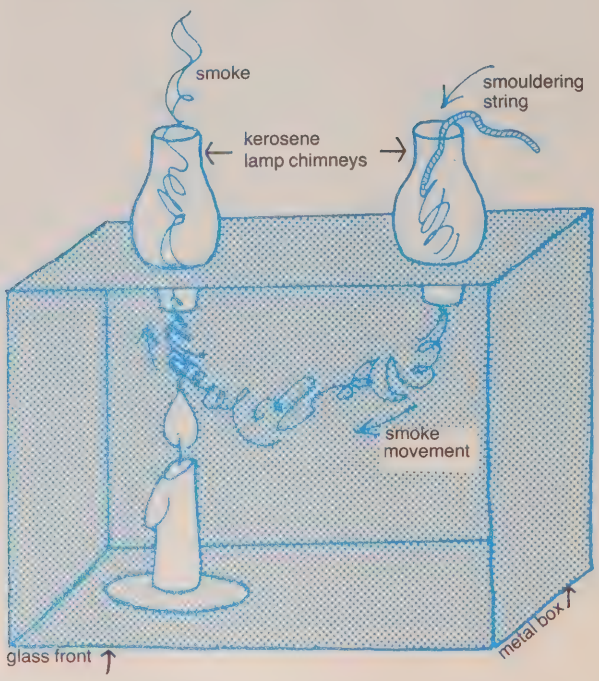
Heating and Cooling My House



Note: For reasons of safety, only the teacher should demonstrate the experiments involving the burning candle and charcoal.

3. You can demonstrate the fact that heated air moves about in a predictable manner in an enclosed area by using a lighted candle and smouldering string in a simple convection box:

Air Movement (teacher demonstration)



A Convection Box

Note: The teacher must demonstrate experiments involving the use of candles and charcoal for reasons of safety.

Related Ideas

1. Discuss with your students how some shelters in Japan and Canada are heated by "body" heat. Gulf Canada Limited (Executive General Offices, 800 Bay St., Toronto, Ont. M5S 1Y8) and Ontario Hydro (700 University Ave., Toronto, Ont. M5G 1X6) have information on how body heat is used to heat their buildings.

2. Ask the students to pretend that all sources of heat are going to be turned off in the building. Have them create a skit or short play about what will happen. How can they prepare for it, and what will they do to keep warm during the coldest time? The play can be shown to another class, and the second group of students can also be involved. (How can they help? — Body heat!)

3. Read the following passage aloud to your students. It refers to a survival room that can be used in case of fuel shortages. After the reading, your students can discuss it, draw a picture of the room, or use the story as the background for a drama activity related to the preceding activity.

> One alternative to freezing in such situations is what Evan Powell, a writer for *Popular Science* magazine, calls the "survival room". He believes that people should be as energy-independent as possible, so that they can live through an energy crisis with a minimum of difficulty.
>
> A survival room, Powell says, is simply a well-insulated section of the house, where the entire family may sleep or coexist for a few days if power goes off or fuel runs out. Such a room might contain first, a fireplace, or a small heater which is run on something other than the main fuel which is used for the rest of the house. It might also contain a campstove kitchen, some kerosene lanterns or candles, and, if the water supply is far away, a marine toilet and a small camper sink with its own water supply.
>
> A survival room can be part of an existing house, possibly the family room. The important thing is that it must be designed so that it can be cut off from the larger living area in order that it can be kept warm with a minimum of fuel. (The little heat escaping from this room would help, of course, to maintain a high enough temperature in the rest of the house to prevent pipes from freezing.) The room should contain a minimum of windows or outside openings, and it should be heavily insulated.
>
> You don't need to wait for a fuel shortage or a power failure to use your survival room, although it would be especially helpful in those situations.
>
> Each winter, newspapers are filled with stories of people who can't keep up with high electric and fuel bills. They are often forced to reduce thermostats to shivering levels, or in some cases they have to abandon their homes. If they had had a survival room, on the other hand, they might stay at home and keep warm.

Source: Adapted from John Rothchild and Frank Tenney, *The Home Energy Guide* (Mississauga, Ont.: Ballantine Books of Canada, 1978), pp. 184-85.

4. Have students find as many recordings as they can that have songs about shelters and weather (e.g., "Baby, It's Cold Outside", or "We're Having a Heat Wave").

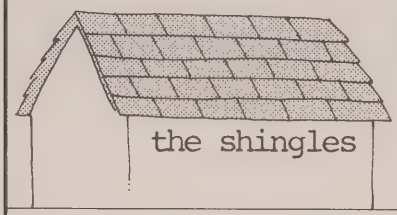
5. Have students investigate friction as a source of heat energy and heat loss. They can rub their hands together and use paper, sandpaper, wood, and a variety of other materials to create friction. Class discussion can revolve around (a) friction as a possibility for heating homes and (b) the amount of energy required just to produce heat.

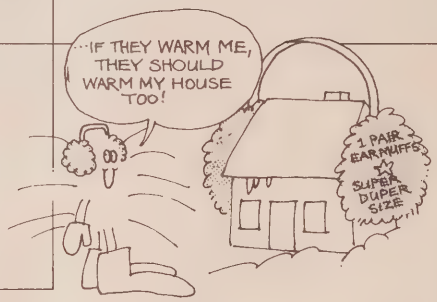
6. Introduce an activity in which students have to fan a floating balloon down to a chair and back to its original position in the air. Discuss how much energy it took to "cool" the balloon and relate this to cooling humans.

Name:

Outside Protection

Make a list of or draw some of the things on or around the shelters in your area (schools, houses, other buildings) that protect them from the weather.





What helps protect the inside of a building from the sun?_____

From the wind?_____

From the snow?_____

Notes

The purpose of this activity set is to have students identify various outside insulating features on and around shelters. The more a dwelling is protected from weather, the less energy it needs for heating or cooling. We need to be aware that sun, wind, rain, and snow are the main elements that affect the inside temperature of a house. Canadians are acutely attuned to the variations in weather that each season brings, especially winter.

Many home designs and construction features, such as roof overhang, southern window exposures, window size, and storm windows, can increase heating efficiency. Natural protections such as trees also provide for reductions in energy use for space heating.

Above all, students should understand that shelters are designed to protect us from the weather. The concepts of privacy and protection from enemies and animals can also be discussed, but the main theme of this activity is protection against weather. You can develop the meaning of "protection" until your students are able to walk around the school area and identify natural and artificial features that protect us from the weather. The following are some that might be included:

1. *natural:* trees (deciduous — sun, evergreen — wind), hills (direction, height);

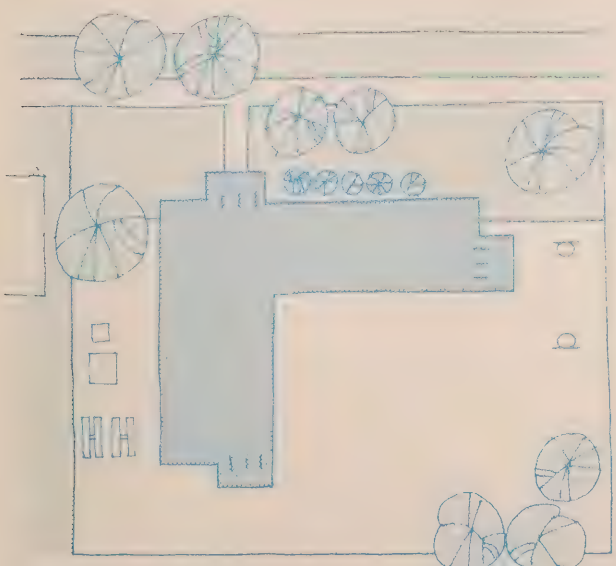
2. *artificial:* walls, garages, overhangs, other buildings, storm windows, direction, exposure to sun, weather-stripping, colours, size and shape of the building, construction materials, number of exposed walls and windows, openings such as vents and chimneys.

Include other types of shelters besides residential ones in the discussions.

Follow-up Activities

1. By taking temperatures in different spots around the school, students will see how the wind and sun exposures can influence the temperatures of the building. Compass work may also be useful here. Have available a drawing of an aerial view of the school so that students can record their findings. As well, make the same recordings on a large class drawing. Make sketches of trees, other buildings, and overhangs that surround the school, as in the accompanying illustration and discuss their effects.

Exposure and Temperature



2. Students can make devices to measure wind direction and wind speed. A strip of paper or plastic can be used as a weathervane to show direction and a pinwheel to measure speed. (See the accompanying diagram.) Students can then mark their findings on their school diagrams to further clarify where the winds are, and what the winds do to increase the heating problems inside the building.

Wind Direction and Speed

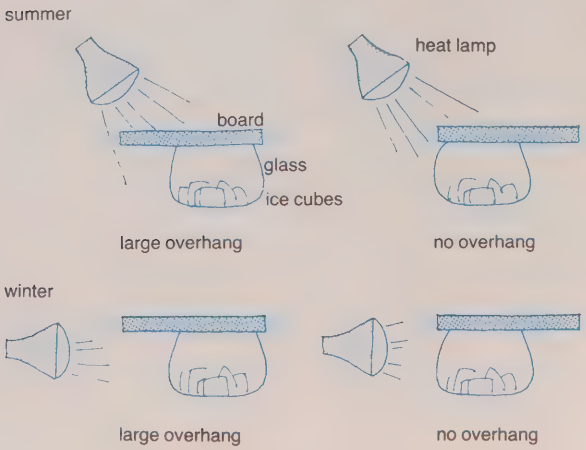
3. An overhang lets the sun enter a building in the winter to help keep the building warm; it also keeps the sun out in the summer to help keep the inside of the building cool. Show students the following diagram on an overhead transparency or on the chalkboard.

Winter and Summer Sun

Source: Adapted from *Energy Conservation in the Home*, p. 57.

Now set up this class demonstration: Put a cup of ice cubes inside a glass bottle. Place a wooden board over the bottle to simulate different overhangs. Place a small heat lamp high over the bottle to simulate the summer sun. Do the same for the winter sun, only reduce the angle of the light rays to the horizontal plane. Move the piece of board to simulate first a large overhang and then a small overhang. Discuss the outcomes and their relationship to natural phenomena.

Overhangs Experiment



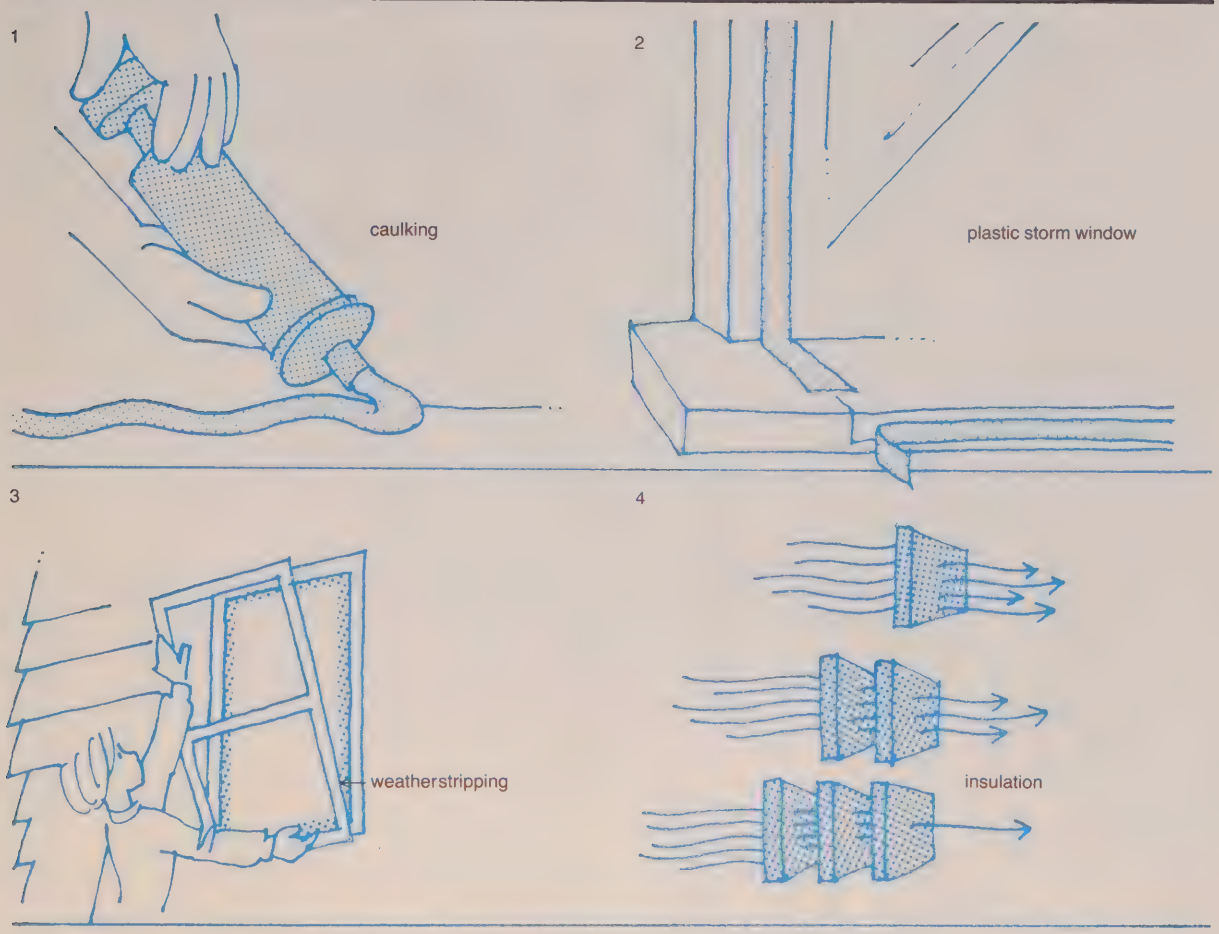
3. Conduct an activity to help students discover how weather-stripping and caulking help to keep cold winter air out of our shelters. Tape five small, precut, rectangular pieces of glass together with masking tape to make a box shape. One of your students can then pour water into the box to locate the places where it can escape. Using only an oil- or resin-base putty or plasticine, caulk these cracks in the box. Then have another student pour water through the box again and note the change in the amount of water escaping. Relate the reduction in the water exchange to the reduction in air exchange after doors and windows are caulked in a building.

Related Ideas

1. Have your students make planting boxes based on the last activity on caulking.

2. Have your students make collage pictures using such protective materials as caulking, weather-stripping, insulation board, or shingles.

3. Have your students write stories about each of the four pictures on page 17. The writing should be preceded by some class discussion, but make this an enjoyable activity. The writing need not be descriptive.



Source: Adapted from Energy, Mines and Resources Canada, *Keeping the Heat In* (Ottawa: Publishing Centre, Supply and Services Canada, 1976), pp. 79, 85, and 87; and U.S. Department of Energy, *Energy Conservation in the Home* (Oak Ridge, Tenn.: U.S. Department of Energy, 1977), p. 61.

4. After you or your students have read the following poem, your students can design a roofscape using lines.

Roofscape

The lines are
straight
and many-cornered —
plunging,
rising high.

From my window
I can see
how roofs
design a sky.

Source: Lilian Moore, "Roofscape", in *Space Poems,* edited by A. Allinson and B. Allinson (New York: Atheneum Publishers, 1975), p.7.

Perhaps your students could design a roofscape using coloured lines.

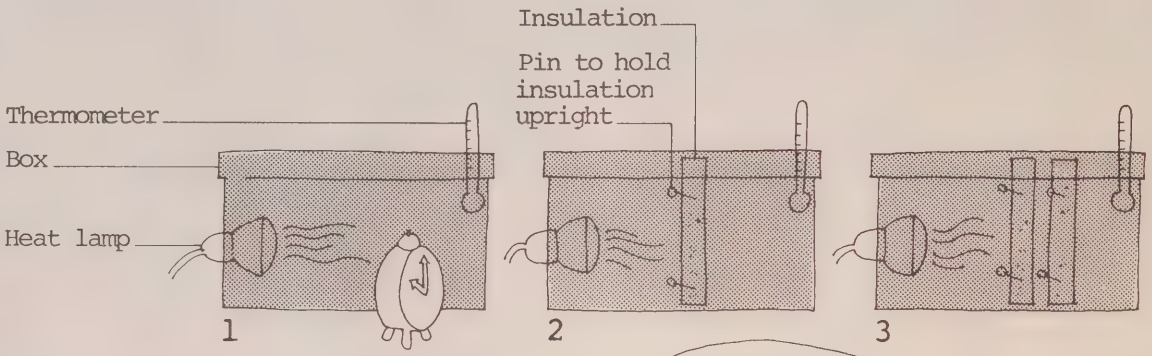
Name:

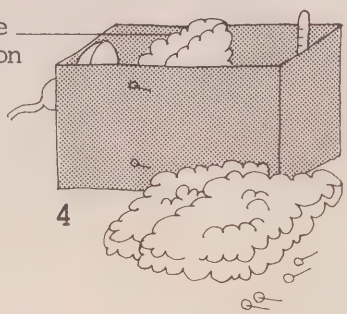
Insulation

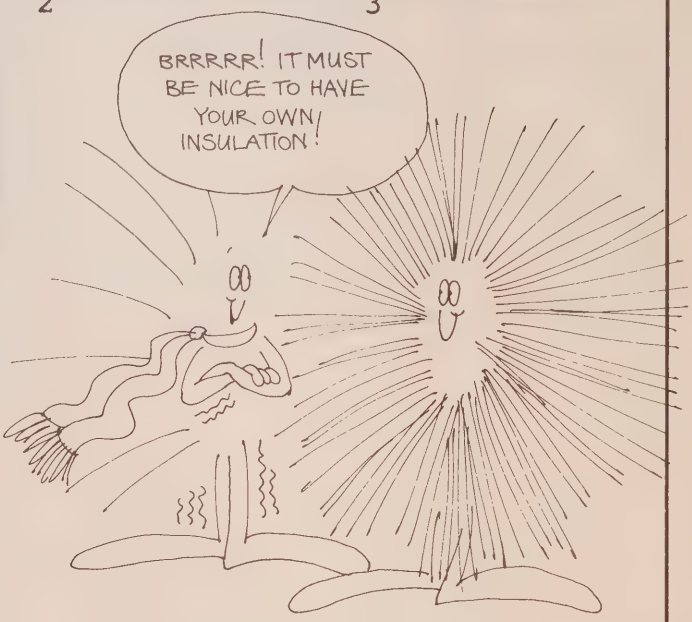
What is insulation?_____

What does it look like?_____

Find out what it does.







Which worked the best?_____

What do you think "R" means?_____

Notes

Once students are aware of the importance of structure size, shape, and outside protection to a building, they can move on to consider the inside of a shelter and the comforts that the shelter can provide against heat loss or entry. As the following quotation explains, insulation is very important to energy conservation:

> Among the many steps that can be taken to reduce energy consumption, the re-insulating of existing housing can offer one of the largest potential savings in the short term. On average, Canadian residential heating consumption can economically be reduced by over 35%. This amounts to the equivalent of *$775 million per year expended for the purchase of imported oil* or more than the total deficit in foreign trade in 1975. For the average homemaker, *fuel bills will be reduced by over $200 per year at current world oil prices.* In large or poorly insulated homes, the savings may be considerably higher.

Source: Energy, Mines and Resources Canada, *Keeping the Heat In* (Ottawa: Publishing Centre, Supply and Services Canada, 1976), p.3.

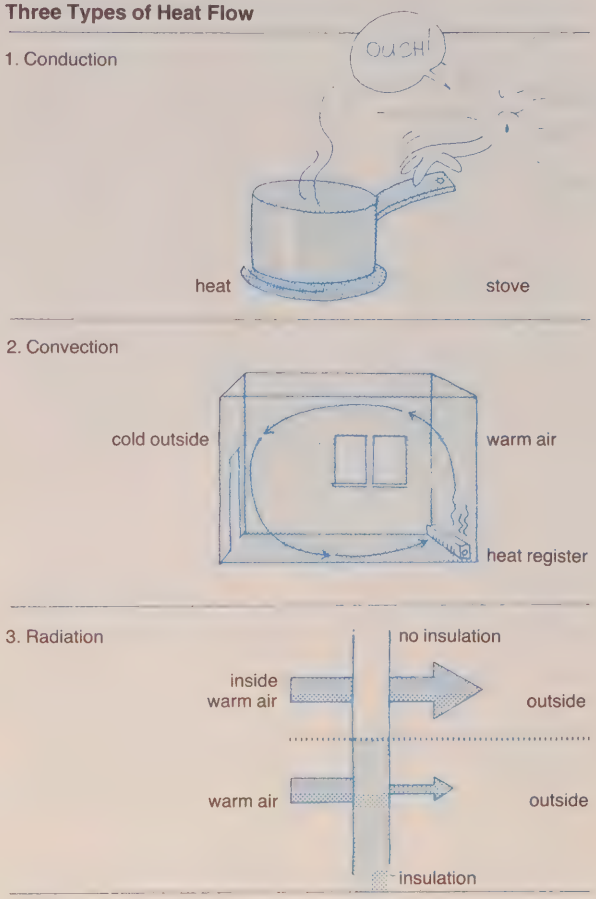
Although children may not appreciate the value of insulation, if they understand and experiment with keeping heat in shelters, they may influence adult attitudes and actions with regards to conserving Canada's energy resources.

Insulation prevents the transfer of heat through walls, ceilings, and floors. Before beginning the experiments outlined on the activity sheet, have your students discuss how heat energy can be transferred from one place to another. The following examples should be considered:

1. *Conduction.* Heat travelling up the handle of a pan on a stove provides an example of conduction. Here heat is conducted through a metal that has no air pockets in it. Because air is a poor conductor of heat, any substance with lots of trapped air pockets in it will not readily conduct heat. (Why use insulation?)

2. *Convection.* When the air around a hot-air register gets warm, it moves upwards first. Its place is then taken by cold air, which is warmed in turn. In this way convection currents are set up. If the ceiling, walls, and floors are cold, the warm air loses heat to the cold surfaces by conduction. Thus, heat is lost both by convection and conduction in the walls and other parts of the house. This loss can be decreased by the use of various forms of insulation.

Three Types of Heat Flow



3. *Radiation.* Light-bulb radiation can be used as an example. When something is placed between a light bulb, the source of heat, and your hand, radiated energy is blocked and your hand does not get as warm as it would if the obstacle is removed. The same principle holds true when there is special insulation between the heat within a shelter and the cold outside.

When experiments are being set up, make sure that the insulation material used is not dangerous and that insulation is kept away from students who are allergic to it. Conduct the experiments as set up on the activity sheet, with an air space between the insulation and the thermometer. Have students record the temperature in each case.

Follow-up Activities

1. Insulation is like having a giant sleeping bag around a house. Have students bring in sleeping bags and blankets. Have them compare the temperature of the inside of a sleeping bag with someone inside it to the temperature of an empty bag. Which is warmer? (This activity can also be done using a tea cosy on one teapot only and adding equal amounts of boiling water to make two pots of tea.) The temperature of both can be compared after ten minutes to see which one stayed the warmest. Have your students explain the difference. Snowmobile outfits or snowsuits can also be examined to see how they keep the heat in and the cold air out.

2. Some people like bare floors and others prefer to cover their floors with carpeting. Have your students do the following activity to determine which is best for keeping heat in a room and why: Students put an ice-cube tray on a thermometer, placing first a fibre floor tile, then a piece of carpeting, and finally a piece of carpeting and padding between the tray and the thermometer. If the thermometer shows no change, have them try feeling the differences with their bare hands. Are the floor tiles and other coverings protection against the cold? Different kinds of carpeting materials, such as wool and nylon, can also be considered.

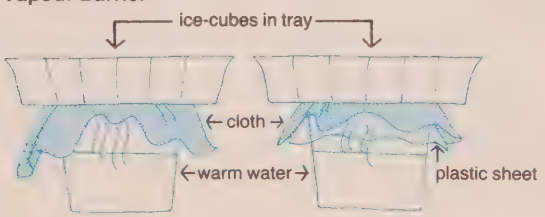
3. Have your students pretend that they are insulation salespersons. Have several of them find out what different kinds of insulation materials there are, and then give short talks to different classes on the types of insulation they are selling. See which type of insulation different classes would buy after all the students have given their talks.

Related Ideas

1. Have students make a large, three-dimensional cardboard model of a home. A garage, a furnace, windows, doors, exhaust fans, fireplaces, a basement, a mail chute, and so on, can then be added. Have the students obtain information about insulation materials and various methods of improving space-heating and heat-retention efficiency in the home (e.g., insulation, rugs, dampers, drapes, storm doors and windows, windbreaks, etc.).

2. A vapour barrier is a sheet (usually plastic) that is put over insulation to keep the moisture in a building from ruining the insulation. As well, the more moisture that is retained in a shelter, the less need there will be for space-heating. Use the following experiment to demonstrate the role of a vapour barrier: Put a tray of ice cubes on top of an open jar of hot water. Put a piece of cloth between the jar and the tray. The cloth should become damp as the moisture from the jar is soaked up by the material. Now put a sheet of plastic over the jar and under the tray and the cloth. The plastic will keep the moisture in the jar, just as plastic sheeting over insulation helps keep moisture in the house away from the insulation.

Vapour Barrier



3. Using the following descriptive passage as a stimulant, have your students draw, act out, discuss their feelings about, or write their own passage about insulating an attic.

Confessions of an Amateur Home Insulator

THE DOOR IN THE FLOOR SLAMMED SHUT and a bolt clicked underneath, sealing my fate. I was trapped, imprisoned until this horrid task was completed.

Through the mist of perspiration, I saw myself, wedged under the attic roof, covered, like some artificial cactus, with millions of irritating fiberglass threads.

I could picture myself one false step later grasping up for the floor beams while my legs dangled down through the bedroom ceiling.

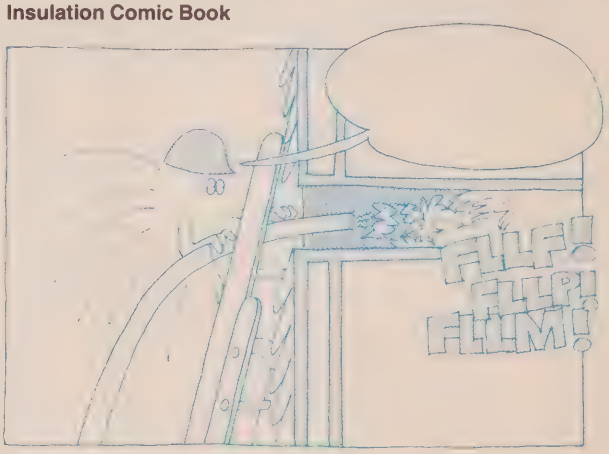
To put a lid on home heat loss (literally), the best place to start, I read, was with the attic. So one spring evening, playing hookey from yard work, I ventured up those big steps and through the closet ceiling.

From my floor-level perspective, the attic looked like a barber shop for a flock of sheep. After sticking a ruler in the loose-fill rock wool insulation, I realized it must have been a very small flock.

Source: Michael P. Martin, "Confessions of an Amateur Home Insulator", *Our Sun*, Autumn 1977, p. 20.

4. Using this picture as a starting point, have your students make a comic book about all the funny things that could happen if they were insulating their homes (e.g., "fleecy" insulation, leg caught in a ladder, etc.). They can draw in cartoon balloons to be filled in with conversation (e.g., "zoom", "zap", for energy thoughts).

Insulation Comic Book



5. Read the following poems to your students. Ask them to make up their own poems or songs about open doors, walls, drafts, and so on, to read to their parents, or sisters or brothers, or even the dog (it has its own door too!).

The Door

Go and open the door.
If there's a fog
it will clear.

Go and open the door.
Even if there's only
the darkness ticking,
even if there's only
the hollow wind,
even if
nothing
is there,
go and open the door.

At least
there'll be
a draught.

Source: Miroslav Holub, *Selected Poems*, translated by Ian Milner and George Theiner (Harmondsworth, Middlesex: Penguin Books, 1967), p. 62. Copyright © Miroslav Holub 1967. Translation copyright © Penguin Books 1967. Reprinted by permission of Penguin Books Ltd.

The Difference

Outside
the world is sky and air
and trees and flowers everywhere.
But inside
it is walls and floor
that lead to outside through a door.

Source: Myra Cohen Livingston, "The Difference", in *Poetry for Young Scientists* (New York: Holt, Rinehart and Winston, 1964).

Name:

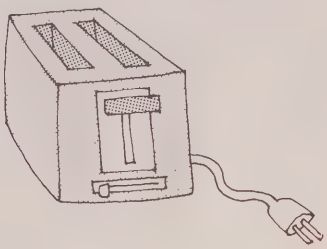
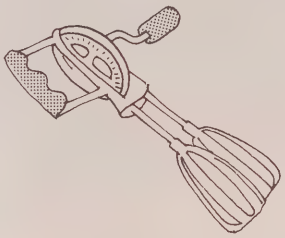
Electricity in Shelters

1. Cut out of a magazine, or draw, pictures of things in your house that need electricity and of others that do not need electricity.

Take a piece of paper and fold it like this:

A.	B.

Now paste the pictures on the correct side of the paper as shown here.

A. Things that need electricity to work	B. Things that do not need electricity to work
	

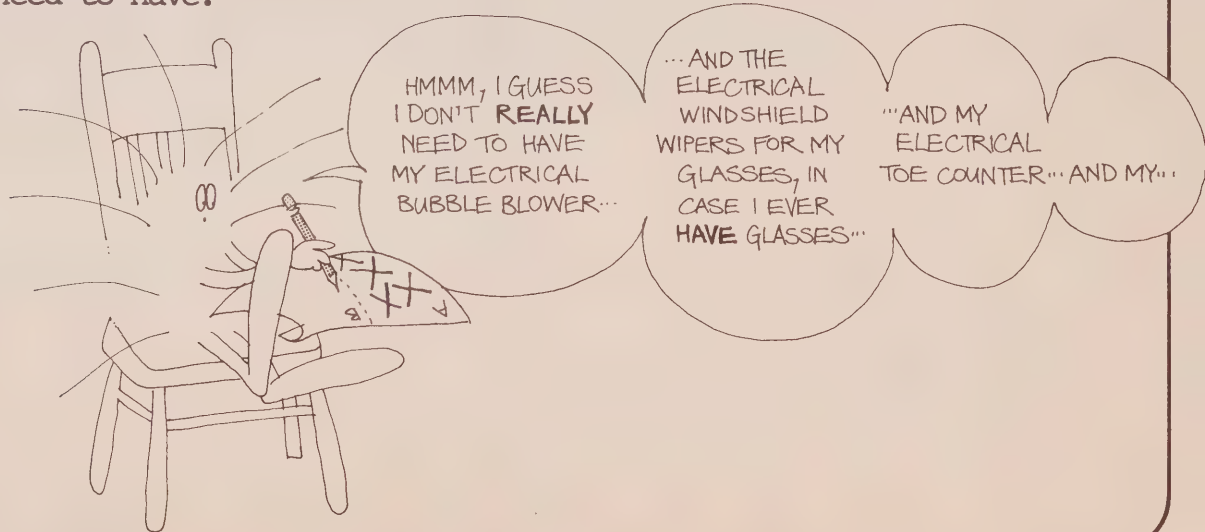
2. Put "1" beside the most important thing in your house that uses electricity.

What did you pick?_____

Why?_____

Put "2" beside the next important thing. Then number the rest "3", "4", "5", ... in the same way.

Put an "x" on all the electrical things that you do not really need to have.


HMMM, I GUESS I DON'T REALLY NEED TO HAVE MY ELECTRICAL BUBBLE BLOWER...
...AND THE ELECTRICAL WINDSHIELD WIPERS FOR MY GLASSES, IN CASE I EVER HAVE GLASSES...
...AND MY ELECTRICAL TOE COUNTER... AND MY...

Notes

This activity set will increase students' awareness of the use of electricity in buildings and of the demands that electrical devices make on energy supplies.

The term "energy crisis" tends to leave a picture of dwindling resources in the minds of most Canadians. Although it is oil that receives the most public attention, it is electricity that, over the years, has become a vital part of a "consumer society's" mentality. The child's day is filled with an abundance of electrical gadgets and activities — so much so that the generation of the sixties and seventies has become known as the "plug-in" generation. *Plug In Drug* by Marie Winn contains a good analysis of the effects of TV on the children of the electric age.

Young children will readily recognize that the appliances used for both work and play around the home and school are run by electricity. But our heating systems (whether they are fueled by electricity, oil, gas, or coal) depend on electricity to switch the fuel on, and it is electricity that pumps water to the upper floors of our buildings. Several aspects of a child's day involve similar hidden uses of electricity. Students need to be aware of what electricity is and where it comes from to develop an understanding of the energies involved in the use of electricity.

Begin the activity by asking your students the following question: If I asked you to find some electricity in the school, where would you look? Common responses will include the plugs and switches. Discuss where electricity comes from and how it works.

Once sources for electricity have been determined, have the children think about their own shelter (home) and then complete the first part of the activity sheet. When they have finished, the second part of the activity sheet can be done as a discussion involving the whole class. This part introduces the ideas of necessary energy use and of conservation. For example, the refrigerator may be considered the most important appliance using electrical energy, since the human body needs energy to live and our energy comes from food. Food storage is essential in large societies.

Follow-up Activities

1. a) Lighting is the third largest energy consumer in a shelter after space heating and hot-water heating. Have the students feel a fluorescent lamp when it is turned on. Have them hold their hand close to an incandescent bulb when it is turned on. Ask them the following questions: How do the lights feel when they are turned on? What actually turns them on?

b) Incandescent bulbs produce a lot more heat than do fluorescent bulbs that produce the same amount of light. Have your students count the number of fluorescent lights and the number of incandescent lights in the school. Have them do the same survey at home, and, with permission, in an office, a restaurant, and elsewhere. Students can record their results on a chart like the following:

	Home	School	Office	Other	Other
Fluorescent	√√	√√√√	√√√√		
Incandescent			√√		

Which kind of bulb is more common? Why? As future consumers and decision-makers, which kind will your students likely have? Why?

2. Have your students each list and then act out in pantomime electrical appliances or devices that they can use at home or in school. They can then record on paper which ones are used to keep us warm, to keep us cool, to keep us looking good, to keep us clean, etc. Have them make a survey chart of all the different things that happen when we use our electrical devices (e.g., noise, heat, light, motion).

Electric Devices Chart

noise	√√
heat	
light	√√
motion	
etc.	

Discuss outcomes of using electrical energy. Can the use of electricity be called waste? Why or why not?

3. Have your students count how many light switches are on and how many are off in the school at 09:00, at recess, at 15:00, and one-half hour after school ends. Have them record their results and then answer the following questions: When were the most lights on? Did they need to be on? Which lights are left on more than the others? How can we share our findings so that others can make use of them?

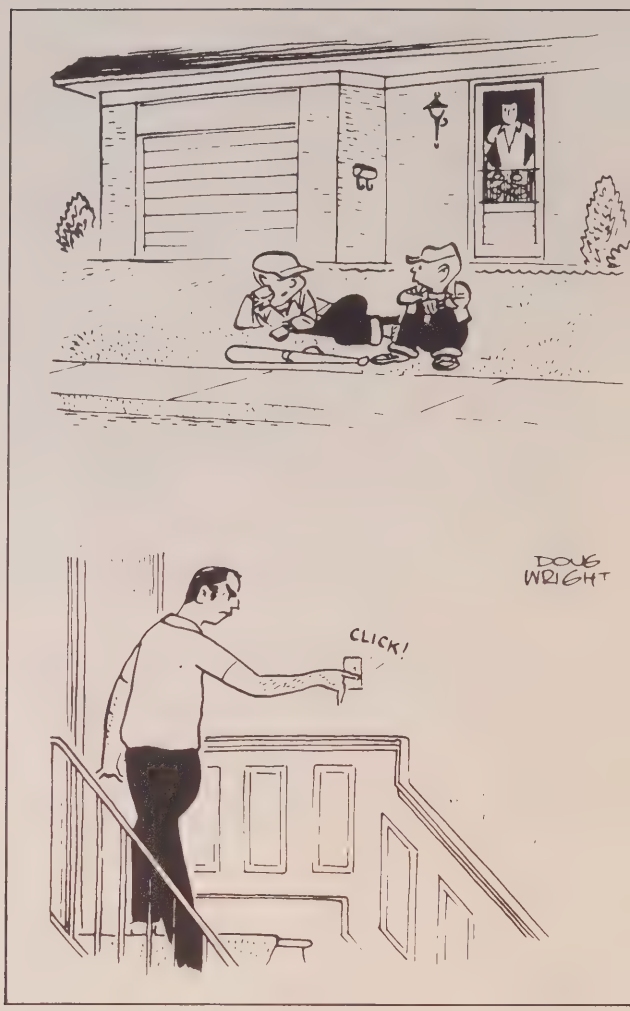
Related Ideas

1. Have your students talk to each class in the school or put on a play about "Turning Lights Out". Then have them repeat the counting activity in activity 3 on page 23 to see whether the talk or play taught the other students anything about conserving energy.

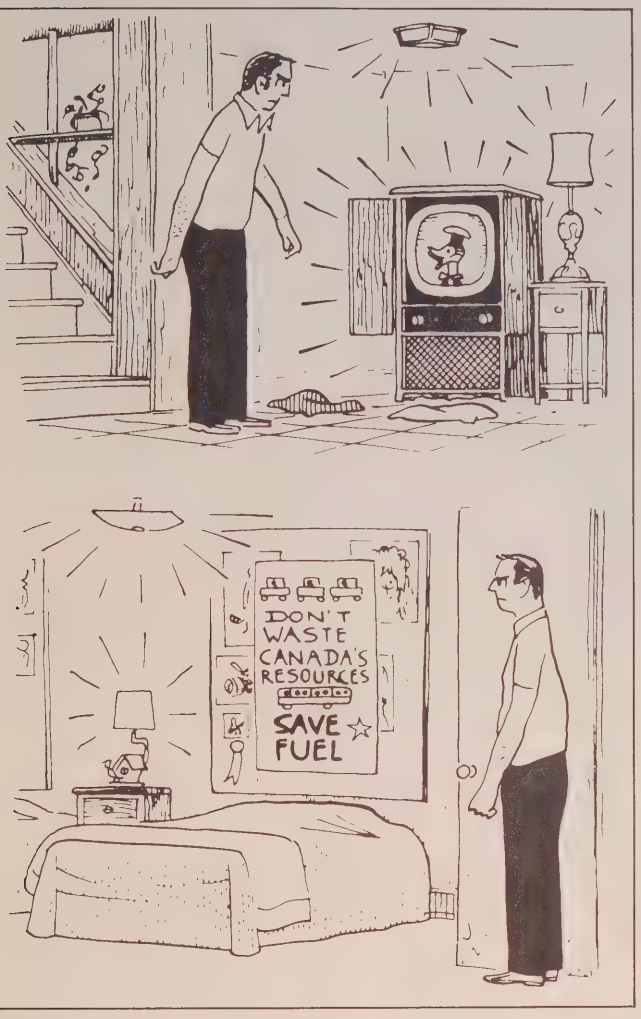
2. Have three terrariums set up in your classroom. They should contain the same kind of plants at the same stage of development. One should stand only in a spot where sunshine will reach it each day, the second only under electric lights, and the third in the dark. Plants need energy to live. Have students keep a diary of the growth in each terrarium in order to answer the following questions: Do plants get energy from the sun? Do they get energy from electric lights? Do they get energy in the dark?

3. Have each student make a booklet of four pages. Duplicate the Doug Wright cartoon and have students cut out the four cartoon pictures, one for each page of their booklets. They can then make cartoon balloons and add words they think suit the pictures.

Doug Wright's Family



Source: Doug Wright, *Doug Wright's Family*, vol. 2 (Toronto: Canadian Magazine Reader's Service, 1975), p. 62. Reprinted by permission of *Weekend Magazine* and Doug Wright.



4. Have your students create poems or songs based on the theme: "A day without electricity is like . . . ".

5. Introduce the topic of glow-worms and fireflies, perhaps by playing the recording "Glow Little Glow-worm" by the Mills Brothers (or one about fireflies, if you can obtain one) for your students, and help them find out about the lighting ability of fireflies and other creatures.

Name:

Heating Survey

Name: _____

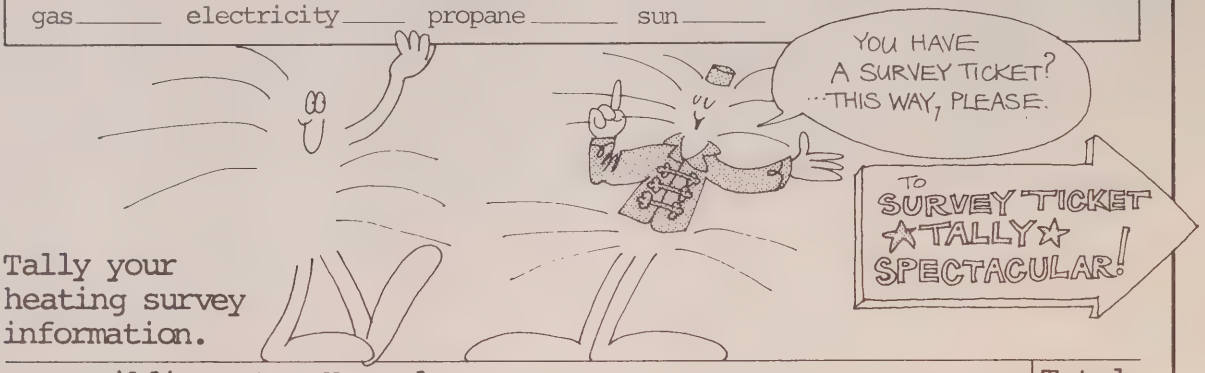
☆ A SURVEY TICKET OF HEATING SYSTEMS ☆

The building is on _____ Street.

It is warmed mostly by:

oil_____ water_____ wood_____ coal_____
gas_____ electricity_____ propane_____ sun_____

_____
signature of adult who helped



Tally your heating survey information.

How Buildings Are Heated	Total
1. oil	
2. gas	
3. water	
4. electricity	
5. wood	
6. propane	
7. coal	
8. sun (solar)	

Now make a class graph of the results.

1. Most of the buildings are heated by _____

2. None of the buildings are heated by _____

_____

3. What is "fuel"? _____

_____

4. Draw a circle around the words in 1 to 8 above that are fuels. What can the others be called?

_____

Notes

This activity set should help to make students aware of the different parts of the system involved in the heating or cooling of a shelter. It should also make them aware of the complexity of this system. You should obtain a copy of *The Billpayer's Guide to Furnace Servicing*, available from Publishing Centre, Supply and Services Canada, Ottawa.

When asked how the air in a classroom is heated, Primary students will probably say: "By the furnace in the basement." They should also understand: (a) that processes occur before the furnace comes on; and (b) what happens after combustion causes the air to be heated. Most homes are heated by oil- or gas-fired systems, and the heat is transported by forced air. In some cases hot water is piped to radiators in the rooms, which then heat the air by radiation. Other home-owners are converting to electric heating as fossil-fuel costs increase.

The survey ticket on the student activity sheet is designed to enable students to get an accurate account of the different ways in which homes and businesses in their neighbourhood are heated. Give each student twenty to forty tickets to give at random to other students in the school, as well as to several local businesses and industries. In this way, a wide range of heating systems can be included in the survey. When the survey tickets have been returned, each student may fill in his/her individual tally. Then the class graph can be developed. The remaining section of the activity sheet should provide the basis for a discussion of how fuels must be burned to produce energy, where the fuels come from, and how fuels get to homes. As the discussion on heating systems proceeds, impress on the students that, at each step of the system, energy is expended and lost. You will need to do some additional reading and research to deal with the ideas mentioned above.

Follow-up Activities

1. Arrange for your school custodian or other appropriate person to explain to your class how the school is heated.

2. Arrange for your students to visit selected homes, businesses, and local buildings to observe different types of heating systems. They should co-operatively write class letters asking permission to have guided visits of these buildings, and also letters of appreciation.

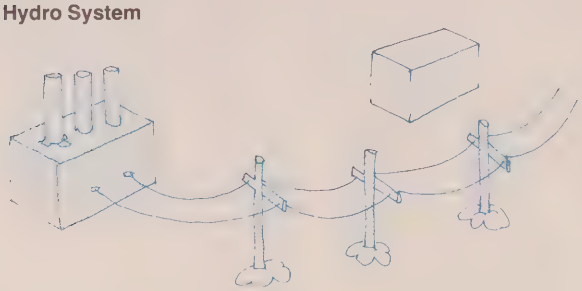
Develop with the class a simple flow chart or diagram to show how the fuel travelled from its source to the buildings to heat up the rooms. The chart or picture can be extended to include the types of workers who are involved at each step of the process. (A series of seven large charts entitled "The Story of Oil" is available in English or French from Shell Oil Educational Services, P.O. Box 400, Terminal A, Toronto M5W 1E1. They show the oil system from the creation of oil to its distribution to homes.)

3. Equip a group of students with flash cameras (a self-developing type if possible) and have each group make a series of pictures for each type of system in a shelter (i.e., the water system, the heating system, the electrical system — pipes, drains, sinks, plugs, fuse boxes, wires, etc.). Alternatively, pictures of these could be found and cut out of hardware, housewares, and appliance catalogues or they could be drawn and coloured. Mount and label the pictures for further discussion and display.

Related Ideas

1. With your class, using available materials, make a three-dimensional model of a hydro delivery system (see the accompanying illustration).

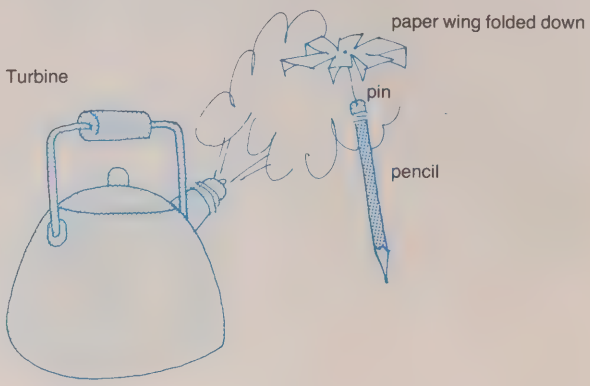
Hydro System



Source: Adapted from U.S. Department of Education, *The Energy We Use*, Grade 1 (Washington, D.C.: National Science Teachers' Association, 1977), p. 16.

Roll up paper to make the telephone poles, put holes in the top with a small-hole punch, and use string from the plant to the poles and onto any simple milk carton houses you might devise. The poles can be kept upright by inserting one end into a clay base.

2. Show students how to make and use turbine models. Pin a folded piece of paper on a pencil (see diagram) and hold it over a whistling kettle, which represents steam pressure.



whistling kettle

3. Have your students make a tape recording of the different sounds of systems in the school or home (e.g., pipes being tapped on, water running, a toilet flushing, fuses being replaced, a furnace turning on). It can be called "Energy Sounds", and can make a good guessing game.

4. Show your class several photographs of parts of systems that bring energy to our homes. Have your students consider and write answers to the following questions: What part of the system came before? What part comes after?

5. Read the following excerpt to your class and discuss it. Ask your students the following questions: What are some of the parts of the system they are hearing about? How many workers are involved in maintaining hydro service? What types of energy are involved in this maintenance? Where is energy wasted?

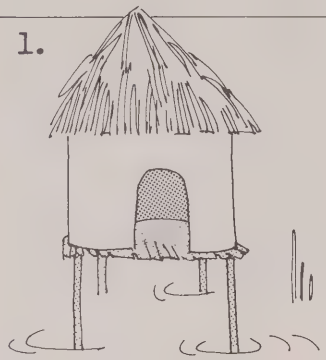
Rarely is the Hydro customer aware of what goes on behind the scenes in maintaining service: helicopters patrolling transmission lines; computers programmed to analyse complex operating problems; foresters trimming tree limbs to avoid contact with conductors; radio-equipped line trucks to speed restoration of power after a sleet storm; skilled linemen using bare hands or special tools to repair a live high-voltage line while it is still carrying power to customers; and highly-trained operators tracking an electrical storm across Ontario and making immediate decisions to prevent power interruptions.

Source: Adapted from Ontario Hydro, *The Gifts of Nature* (Toronto: Ontario Hydro, 1974), p. 17.

Name:

Shelters and Homes

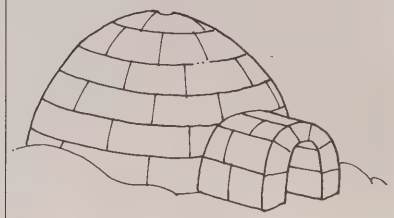
1.



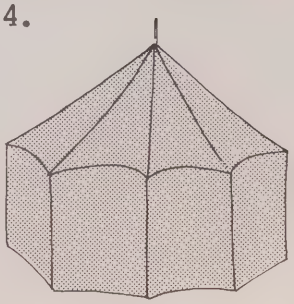
2.

My House

3.



4.



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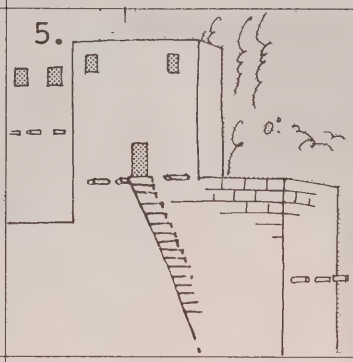

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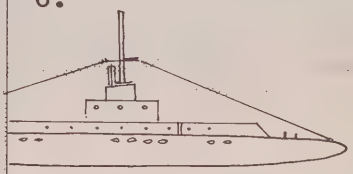

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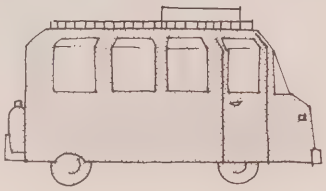

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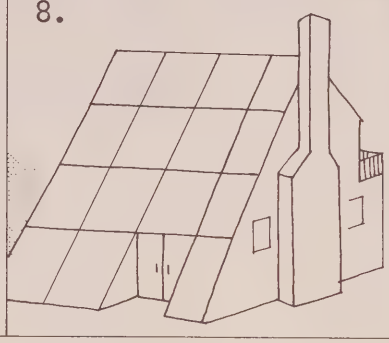

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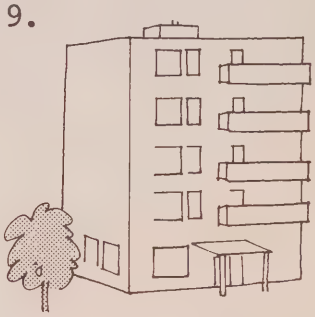


1. a) Put an "x" on the shelters that are heated from the inside.
   b) Put an "o" on the shelters that are heated from the outside.

2. Think of the words heating and cooling, and other ways shelters are alike. Match the shelters that you think are like each other in some way.

3. Which shelters get their heat mainly from the sun?

_____

4. Which shelters are moveable? _____

5. Which shelters are temporary homes? _____

Notes

By this point, students will have discussed electricity, how to heat and cool space, the forms of energy used for space-heating, and the materials used to build shelters. They should now learn about shelters that exist outside of their community and those that were used in different time periods from their own. Different weather conditions and geographical features have led to the need for different kinds of shelters. In each case, local materials and energy sources are used. The location, construction materials, and heating/cooling methods used in these shelters should all be related to each other.

It is most important that you make available to your students several books on shelters, ranging from those used by cave dwellers to those used by space travellers and located from the North Pole to the equator. If possible, include picture books, easy readers, and encyclopedias. Read sections of the books to the class or show your students visual material such as filmstrips and movies before assigning the activity sheet. Try to centre the class discussion around the concept that shelters are a protection from heat and cold, and that some shelters are temporary and some are portable.

Once students have enough background information, those in Grades 1 and 2 can cut out the pictures on the activity sheet and paste them onto a large piece of folded newsprint or into a booklet. For these young children, you may wish to print descriptive information under each picture as the children dictate. Older students may print or write their own. Have them include in their descriptions information on what the shelter is made of and what type of energy is used to heat or cool it.

Provide students with a second activity sheet so that they can complete the second activity on the sheet. Have them cut out and match the shelters in pairs or threes according to similarities or differences. They should then paste them on sheets of paper and discuss and share their findings.

The following are some possible pairings:

- #1 and #5: Both are used to keep cool inside; #1 uses a thatched roof and #5 uses thick walls.
- #6 and #7: Both are self-contained units designed for mobility. The energy source for both is created from burning oil or gas (propane).
- #4 and #8: Both are heated from the outside.
- #3 and #5: Both have been constructed by packing material together; one is kept in place by baking, the other by frozen water.

Several outcomes could result from this activity. Above all, try to emphasize the use of energy for space-heating and cooling.

Follow-up Activities

1. Locate for your students the North Pole, South Pole, and equator on a globe. Discuss with your students why each is either very hot or very cold. Now connect a string from the school's location to a series of selected places on the globe. Discuss with the class the resources available in these places, the climate, and how a building there might be heated or cooled. Have the class collectively describe a suitable shelter for each place.

2. Have your students make three-dimensional models of different shelters in the world using such materials as popsicle sticks, paper, cardboard, toothpicks, plasticine, and stone. Group the models on a sand table or on a papier-mâché setting according to (a) whether they keep heat out, (b) whether they keep heat in, (c) the type of fuel or other means used to keep them warm or cool (i.e., oil, coal, wood, peat, electricity, natural gas).

3. Have your students make a mural of mobile shelters ranging from pirate ships to submarines, from Chinese houseboats to an oil tycoon's yacht, from a gypsy caravan to a modern-day mobile home, from a tent trailer to a truck driver's sleeper cab.

Related Ideas

1. Discuss the history of energy with your students. Consider the cave-dwellers' use of fire, the fireplaces used to heat mediaeval castles, early coal stoves, oil stoves, modern furnaces, and the use of solar energy today.

2. Have your class make a bulletin board display by listing and illustrating different kinds of shelters. Each shelter should be linked to the type of fuel or other means used to heat or cool it.

3. Have your students write or tape-record poems and draw pictures dealing with animal homes. Here is an example:

Snail
Snail upon the wall,
Have you got at all
Anything to tell
About your shell?

Only this, my child —
When the wind is wild,
Or when the sun is hot,
It's all I've got.

Source: John Drinkwater, "Snail", *in Poetry for Young Scientists*, edited by Myra Cohen Livingston (New York: Holt, Rinehart and Winston, 1964), p. IV.

Name:

Clothing: How and Why

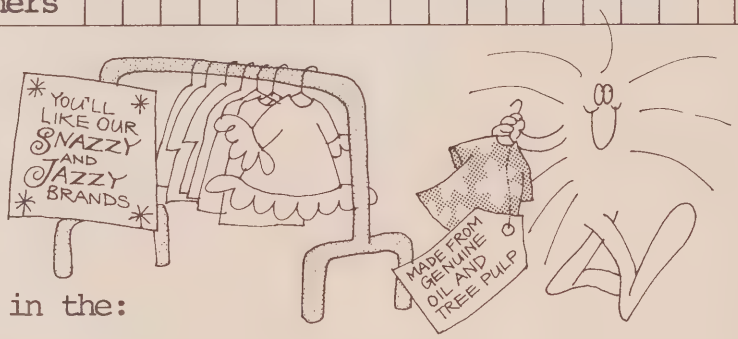
After everyone in your class has put four different kinds of clothing in a big pile, sort the clothing in the following ways:

1. The Season We Wear It

Spring																				
Summer																				
Fall																				
Winter																				

2. What the Clothes Are Made From

Natural Fabrics																				
Vegetable - wood, rubber, cotton, flax																				
Animal - wool, leather, silk, feathers (down)																				
Fabrics Made by People																				
Petroleum (oil) - polyester, nylon																				
Cellulose (tree pulp) - acetate, rayon, others																				



3. What kind of clothes do we wear in the:

spring? _____

summer? _____

fall? _____

winter? _____

What are most of the clothes in the class made from?

_____

Notes

In this activity set, your students will learn about the personal shelter we call "clothing". Natural fabrics have been part of human existence since the beginning of recorded history. In those days, natural fabrics were gathered and harvested by people, yet people had very little control over such features as strength, resiliency, and uniformity. The four major natural fibres — wool, linen (flax), cotton, and silk — are made from long-chain polymers (think of sugar), but are susceptible to bacteria and mildew. Weather, faulty cultivation methods, drought, blight, disease, the composition of minerals in the soil, insects, and so on all affect the supply of these materials. While natural fibres have disadvantages in terms of wearability, they have been the source of our clothing for 99 per cent of recorded history. A good reference on this topic is George E. Linton, *Natural and Man-Made Textile Fabrics* (New York: Meredith Corporation, 1966).

Synthetic fabrics have provided a large percentage of our clothing since World War II. These fabrics have qualities that we can create and control. They can be produced in any season with no danger from disease or weather. They are manufactured by the chemical processing of certain raw materials such as wood pulp, petroleum extracts, and the by-products of coal. However, the demand for such synthetics as nylon and rayon also makes a demand on various energy sources that are limited in supply.

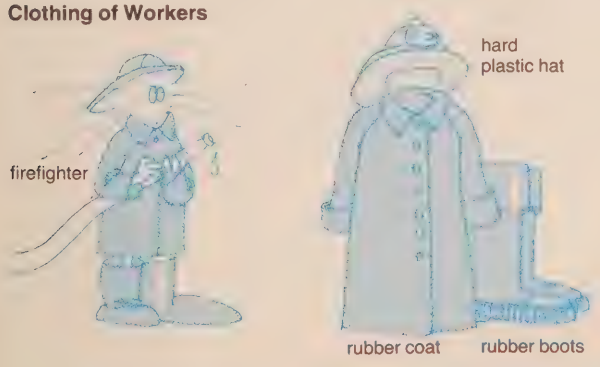
Have your students discuss the reasons we use clothing. Have them feel the materials that their own clothing is made from. Stimulate thinking about where the fabrics come from. Students might understand the sources of cotton and wool, but it is unlikely that they will be aware of the origin of synthetics. You will likely have to supply this information.

Have your students bring from home four pieces of clothing that are as different from one another as possible. The activity sheet suggests the variety of clothing that might be brought to school. Help your students complete the chart by reading the labels for each piece of clothing. Encourage them to think about the source of each fabric. Have them put a checkmark on the charts in parts 1 and 2 of the activity sheet for each piece of clothing. Part 3 reminds students to think of clothing as a means of keeping warm or cool.

Follow-up Activities

1. Collect pictures of various workers (i.e., a firefighter, a hydro meter reader, etc.) to show the special kinds of clothing they wear in their work. Help your students list each worker's clothing and the material from which it is made.

Clothing of Workers



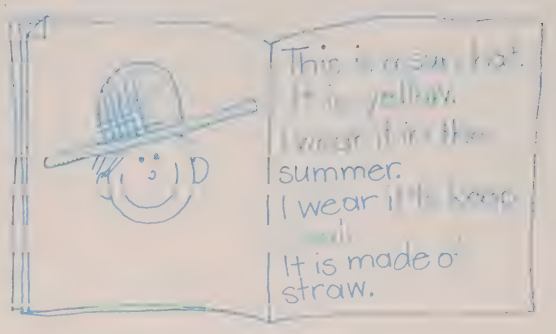
2. Have students make a collage of clothing advertisements from newspapers or magazines. Have them determine which kind of clothing is advertised most. They can draw black lines around synthetic fabrics and red lines around natural fabrics in order to become more aware of the energy used to make synthetics.

Related Ideas

1. Have a patch day at school on which everybody wears patches of different materials. How great was the variety?

2. Have your students draw or collect pictures of clothing such as indoor/outdoor, summer/winter, sport/work, and so on, and make booklets that classify and describe kinds of clothing.

Clothing Booklet

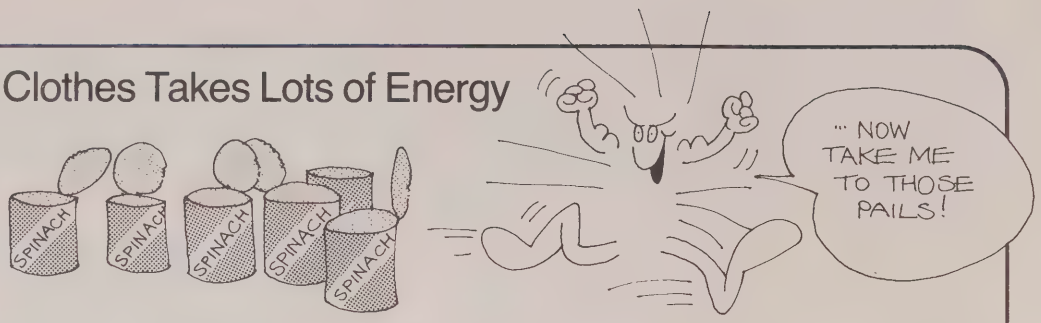


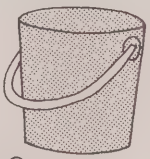
3. Have a class fashion show. Expand this by discussing changes in fashion and how they come about.

4. Teach your students how to make macramé hangings from jute, nylon, or wool as a useful activity related to fabrics.

Name:

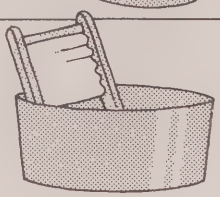
Washing Clothes Takes Lots of Energy



1. 

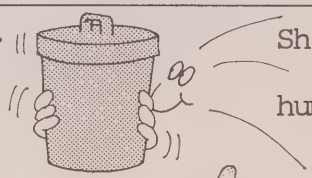
Hand-washing Pail

human energy ☐ clean rating ☐

2. 

Washboard and Pail

human energy ☐ clean rating ☐

3. 

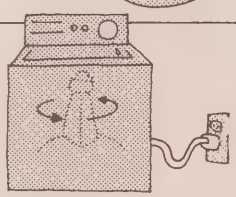
Shimmy-and-Shake Pail

human energy ☐ clean rating ☐

4.

Stirring-only Pail (no shaking, no pounding!)

human energy ☐ clean rating ☐

5. 

Agitator Electric Washer (not automatic)
(Use 1 pail of water and operate for 10 min only.)

human energy ☐ clean rating ☐

Each group washes for 10 min.

Put an "x" on the hardest way.

Put a ☺ on the easiest way.

Have another class rate your pillowcases from cleanest (1) to dirtiest (5).

Were other forms of energy used besides people energy? _____

_____

Washing Clothes Takes Lots of Energy

Notes

The purpose of this activity set is to make students aware of the need for electricity in the maintenance of clothes. Synthetic fabrics require different kinds of laundering from natural fibres. Usually they require less laundering than natural fibres. Therefore, the energy demands made on us and on our machines are lessened. The major energy used in clothing maintenance is the electricity required to heat the wash water, the dryer, and the iron.

Energy can be conserved through careful buying of and caring for clothes. The use of the solar dryer (clothes line) instead of the electric dryer is one way of conserving energy.

The activity described on the activity sheet will help students understand the advantage that electrical devices have over human energy. You will require the following materials:

- four pails (one with a cover)
- a washboard (if available) or a similar device
- detergent
- a stick
- five old cotton pillowcases
- five old polyester pillowcases
- permission to use a school washer or someone's home washing machine (a non-automatic, agitator-type washer).

The same amount of water and detergent must be used in all of the pails and in the washing machine. Dirty the five cotton pillowcases (with ketchup, mud, etc.) and identify and place each in one of the five "washers" indicated on the activity sheet. Divide the class into five groups, and have each group take a turn at each of the five methods: After ten minutes, or a short wash cycle, the students can compare how they feel about the work, their energy input, and their pillowcases.

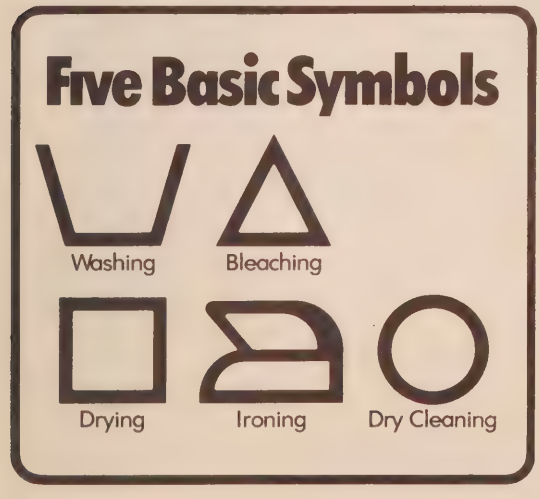
After the pillowcases have dried, the students can show them to other classes and have them rated from "1" (cleanest) to "5" (dirtiest). They can then discuss what additional laundering energies, such as drying and pressing, are required.

The activity can be repeated with an "easy-care" polyester permanent-press pillowcase. Your students could then discuss the following questions: Are the energy inputs and results the same for cotton and polyester? Is an electric washer your favourite way of cleaning clothes? Why or why not?

Follow-up Activities

1. Have your students use the labels on their clothing to compare more energy-intensive clothing materials to less energy-intensive materials. How do they differ?

Labelling Symbols



2. Have the children make drawings of clothing worn by different people (e.g., TV or movie stars, parents, pioneers, astronauts). They should then decide which clothing requires the most energy to keep clean and neat.

3. Have your students act out the song "This is the way we wash our clothes". Discuss various actions.

Related Ideas

1. Help your students compare a "laundry outfit" of 1908 (see accompanying ad) to its modern equivalent in terms of energy required, cost, and convenience.

Laundry Outfit from Sears-Roebuck Catalogue

Source: Sears, Roebuck Catalogue, 1902. Reprint ed. (New York: Crown Publishers, 1970), p. 372.

2. Help your students compare the advantages and disadvantages of clothes that require dry cleaning to those that can be cleaned in a washer. (Related factors such as transporting the clothes to the dry cleaner and purchasing soap should also be considered.)

3. Read to your students the following excerpt from *Travels With Charley* by John Steinbeck. Discuss it with them and then have them make up brief anecdotes about similar experiences in which electricity is not available.

> Before I started my tour, I had known that at intervals of every few days I would have to stop at auto courts or motels, not so much to sleep but for the sake of hot, luxurious bathing. In Rocinante I heated water in a tea kettle and took sponge baths, but bathing in a bucket delivers little cleanliness and no pleasure whatever. A deep-dish sit-down in a tub with scalding water is a pure joy. Quite early on my trip, however, I invented a method for washing clothes which you will go a long way to better. It came about this way. I had a large plastic garbage bucket with cover and bail. Since the normal movement of the truck tipped it over, I tethered it by a length of strong elastic rope of cotton-covered rubber to the clothes pole in my little closet, where it could jiggle to its heart's content without spilling. After a day of this, I opened it to dispose of the stuff at a roadside garbage can and found the most thoroughly mixed and kneaded garbage I have ever seen. I suppose all great inventions spring from some such experience. The next morning, I washed the plastic bucket, put in two shirts, underwear, and socks, added hot water and detergent, and hung it by its rubber rope to the clothes pole, where it jigged and danced crazily all day. That night I rinsed the clothes in a stream, and you've never seen clothes so clean. Inside Rocinante I strung a nylon line close to the window and hung the clothes to dry. From that time on, my clothing was washed on one day of driving and dried on the next. I even went overboard and washed sheets and pillow cases that way. So much for daintiness, but it didn't take care of hot baths.

Source: John Steinbeck, *Travels With Charley* (New York: Viking Press, 1962), pp. 41-42.

Name:

Were My Grandparents' Clothes the Same As Mine?

$5.75 OUR FINEST ALL WOOL BLACK VICUNA CLOTH SCHOOL OVERCOATS.

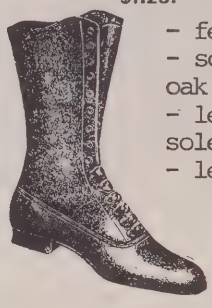
- wool
- velvet collar
- venetian cloth lining

$1.98

Child's Washable Pique Coats
Ages 1, 2, 3, 4 and 5 Years.

- wool
- chinchilla
- eiderdown
- silk
- patent leather
- sateen

Ladies' High Cut Felt Lace, $1.25.



- felt
- solid oak
- leather sole
- leather

A FINE SUMMER LEGHORN
This hat is an imported Italian leghorn flat.

Infant's Long Cloak

$2.25

- cashmere
- silk braid
- lined with flannel
- sateen

WINTER

Special Wool Mixed Union Suits, 79 Cents.

- wool-cotton mixed
- pearl buttons
- jersey

$4.48

- silk
- velvet
- ostrich feathers
- wire

McINTOSH, BROWN AND GREENE & CO.'S GREEN MIXED WOOL SUIT.

$8.98

- velour
- cassimere
- silk
- wool) shoulder
- felt) pads

$54.25

NORTHERN RACCOON SKIN COAT WITH GENUINE OTTER COLLAR AND CUFFS.

- raccoon
- otter
- lined with quilted linen

Ladies' Double Breasted Wool Cashmere Mackintosh

- wool kersey
- Persian lamb collar
- lined with satin

Price $16.75

Source: Sears, Roebuck Catalogue, 1902 (New York: Crown Publishers Inc., 1970), pp. 1039, 984, 954, 1160, 1148, 1130, 1081, 1093.

Notes

Clothing changes over the years. The demand for new styles of clothing, cost considerations, and the development of new materials for clothing have produced an industry that is constantly creating new ideas. As the children are introduced to the idea that different clothing existed at different times in history, they should gradually move towards an understanding of "energy-wise clothing".

The first clothes were wild-animal pelts. These were wrapped around the body from shoulder to knee and fastened with a thorn. Years later, sheep were domesticated, and the fibres from their wool were pressed into a felted mass to be used for clothing. By the beginning of recorded history, all four natural fibres — cotton, linen, silk, and wool — were being woven into cloth.

In 1884, Count Hilaire de Charlommet studied the silkworm and then was successful in making a nitro-cellulose solution that was forced through a nozzle into a chemical bath so that the fibre could be solidified by coagulation. Thus was produced the first synthetic fabric.

The war demands of the 1940s and the research of the 1950s led to the production of many new kinds of fibres — nylons, polyesters, acrylics, and other synthetics. Thus, in a period of thirty years, natural fabrics and clothing gave way to synthetic ones. With this change came an increased dependence on coal, wood pulp, and oil.

The pictures shown on the student activity sheet are taken from a 1906-8 catalogue. Have your students discuss the types of clothing pictured on the activity sheet and the materials from which they are made, in terms of their great-grandparents' lifestyle. Then have them cut out pictures of similar clothing from a current catalogue. They should take note of prices and materials. They could then discuss:

– why today's clothing costs more;

– why different materials are used today;

– what different materials are used today; and

– which clothes are better and why.

Follow-up Activities

1. Now that the children are aware that clothing fabrics have changed and of some of the advantages of such changes, they can explore some possibilities concerning clothes in the future. Have them draw designs of such clothes after discussing with them some ideas to think about (e.g., controlled-temperature or controlled-environment suits).

2. Your students can actually process wool in the class — carding, dyeing (natural), spinning (on a spindle), and weaving. Good books on the process are available in most libraries.

3. Students can study the structure of natural and synthetic fabrics under a magnifying glass.

4. Leather is an expensive material today, but it was a major raw material in the past. You might arrange to have your students visit a shoemaker's shop to see how much energy is required to rebuild shoes. They can also bring in different samples of shoes (e.g., runners), examine other shoes, and discuss the energy sources required to make them.

5. Have your students examine specialized clothes (e.g., sports, leisure, diving, astronautical) to note how they are different from everyday clothes (in terms of thickness, mass, texture, flexibility, colour, design, cut, and fastenings).

Related Ideas

1. Have your students make a series of decorative collages using a variety of clothing materials.

2. Have your students make clothes-pin bottles and wishing wells out of clothes pins.

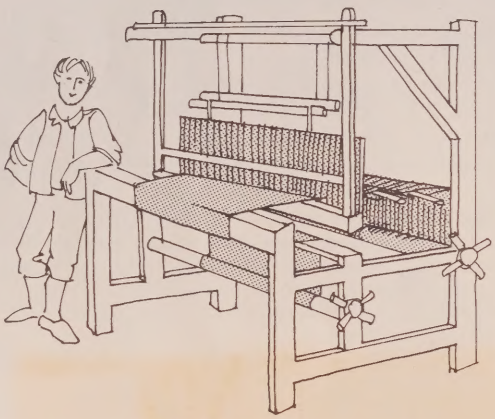
3. Have an old-fashioned hat-making contest using feathers and a variety of old-fashioned hat materials.

4. Have your students draw or paint clothes of the past, present, and future, and hang them on different clothes lines in the classroom.

5. Have a scavenger hunt for old clothes. With the co-operation of parents and grandparents, students can put together a collection of old clothes to be kept on display for a week or so. They could make direct comparisons in terms of styles and fabrics between these clothes and clothes that are used for the same purpose today.

Name:

How Pioneers Produced Clothes



Notes

The purpose of this activity set is to compare the overall energy intensiveness of the steps involved in natural fabric production (wool) to those in the production of a synthetic fabric (viscose and rayon from cellulose and nylon from petroleum). By disregarding the advantages and disadvantages of mass production, maintenance requirements, and versatility, the main activity focuses on the large number of energy steps required in the manufacture of today's synthetic fabrics when compared to the production of natural fabrics. Today's dependence on such energy sources as oil and wood pulp is emphasized.

Energy sources are required at all steps of the system in the creation and manufacture of synthetic fabrics. A description of how rayon is produced can be found in Dorothy Lyle, *Modern Textiles* (Toronto: John Wiley and Sons Canada, 1976), page 63. Technical information on nylon production can be found in M. Cowan and M. Jungerman, *Introduction to Textiles* (New York: Appleton-Century-Crofts, 1969).

Using the activity sheet, your class can discuss the following topics related to pioneer clothing production:

– the amount of human energy required

– the use of other sources of energy (food, water, etc.)

– the source of dyes

– the quality of the finished product

Whatever direction the discussion takes, you should emphasize the fact that very little energy, other than food and human energy, is used in the whole process shown in the illustrations.

Try always to emphasize the amount of energy used in the total system from raw material to finished product. Ask your students whether we will someday have to return to the use of natural materials for clothing (i.e., wool, cotton, and furs).

Follow-up Activities

1. The body itself provides a natural system of clothing. Your students can discuss and research the purpose of hair, shivering, goose bumps, perspiration, skin, and so on, as part of the body's own clothing system.

2. At each stage of our lives our clothing habits and our physical characteristics change. Have your students cut out, draw pictures, or bring in actual samples of clothing for babies to adults. The pictures can be hung sequentially on a clothes line or arranged to make a long mural.

3. Have your students consider the array of clothing in the previous activity and compare the amounts of energy required in their manufacture, waste (e.g., disposable diapers), and recycling (e.g., old jeans). Which age group wears the most energy-efficient clothes?

4. Cotton has an interesting history. By comparing the method of early production (slaves) to the modern cotton gin, students can come to understand the relatively major importance that the manufacture of cotton had in the past, and how modern cotton production uses different sources of energy (fewer jobs but more energy!). Asbestos, to use another example, was once widely used in oven mitts, firefighters' clothes, and astronautical clothing. Today it is not because it has been found to have serious limitations due to the danger it poses to the workers involved in its manufacture.

Related Ideas

1. Have your students tie-dye or batik fabrics.

2. Have your students make purses, pencil cases, or packsacks out of the legs of old jeans.

3. Have your students use creative stitchery to dress up hand-me-downs such as blouses and slacks.

4. Guide your students in some experiences with natural dyes. These can range from onion skins to apple bark. A good reference is "Dye Plants and Dyeing: A Handbook" by the Brooklyn Botanic Gardens Record (see bibliography).

5. There are several types of simple looms that could be made and used in the classroom. Have your students use such a loom to make such items as pot holders, scarves, and afghans.

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